



Responding to climate change: Climate-based seed transfer

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Tree Improvement Branch
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1. Legislation, regulations and standards
2. Climate-based seed transfer (CBST) description
3. Western larch seed policy framework, a CBST example
4. Why is CBST important?
5. CBST project
6. Other climate projects associated with seed
7. Other seed policy matters



- ▶ **Legislation, regulations and standards**
- ▶ B.C. tree seed use is regulated under the *Forest and Range Practices Act*, accompanying regulations and the *Chief Forester's Standards for Seed Use*.
- ▶ For reforestation on Crown Land, licensees are obligated to use registered seedlots and to transfer seed according to the standards



- ▶ **Seed transfer standards**
- ▶ Seed transfer is based upon geographically defined seed planning zones with latitude, longitude and elevation limits
- ▶ Seed transfer is categorized by seed source (natural stands, seed orchard, superior provenance) and defined uniquely for each species x category
- ▶ Provincial reforestation is around 200 million to 250 million seedlings annually (less than 5% is used on private land)

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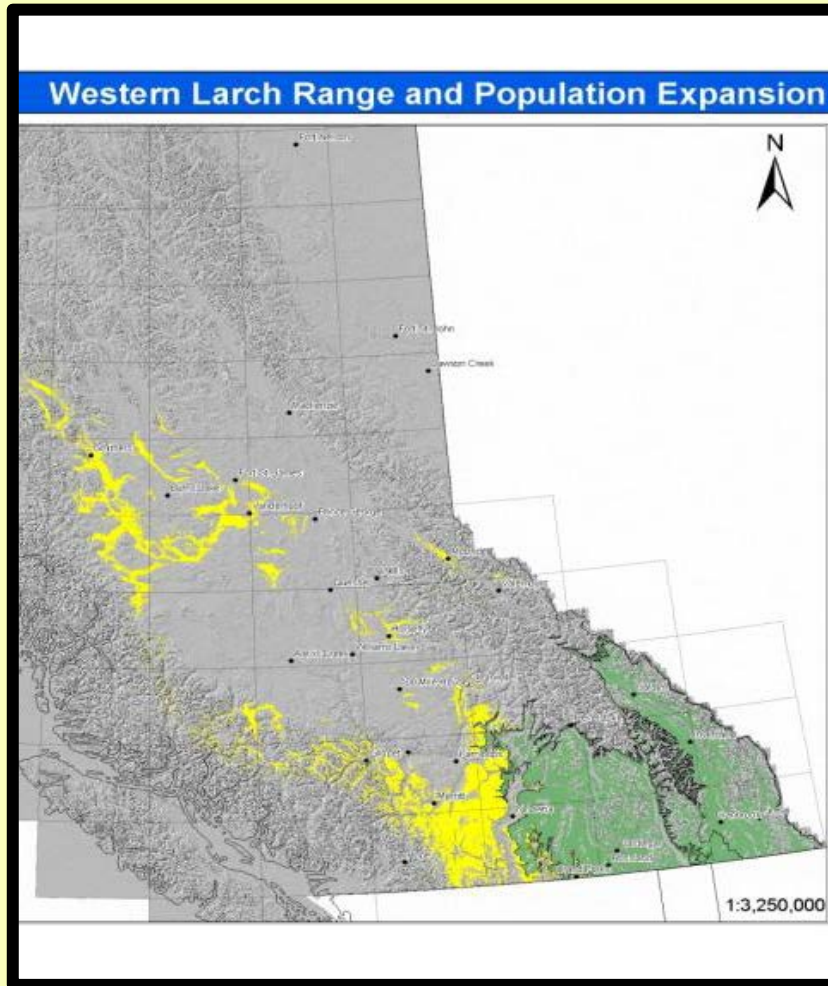
Chief Forester's Standards for Seed Use

The province's chief forester established the *Chief Forester's Standards for Seed Use* in accordance with the *Forest and Range Practices Act* and its regulations. These standards came into effect on April 1, 2005.

These standards require that seed used to establish a free growing stand on blocks subject to *Forest and Range Practices Act* must be registered and stored with the Tree Improvement Branch. Seed must meet specific collection, genetic diversity and physical quality requirements to be eligible for registration. Seed that has been genetically modified cannot be registered.

The standards require people to select seed with a genetic worth (level of improvement) of 5% of greater for the trait that best meets the forest management objectives of the stand. Seed must also be transferred from its source to a planting site in accordance with the

- ▶ Recent seed transfer amendments with a climate change lens
 - ▶ i) upward elevation limits (November 2008)
 - ▶ ii) new seed planning zones for western larch (June 2010)
 - ▶ iii) revisions to western larch SPZs (May 2014)
 - ▶ iv) approved alternatives to Chief Forester's Standards for Seed Use (CF Standards)



Features of the western larch policy (2010)

- i) Science-founded creation of 3 new seed planning zones
- ii) Based upon climate modelling in the year 2020
- iii) Planting is limited: up to 10% of seedlings by licensee per year



▶ Western larch policy review

- ▶ i) Raster data had blocky edges of the shape file
- ▶ ii) small raster size, fitting a few Lw in amongst other trees species in a plantation leads to higher planting densities, and
- ▶ iii) generally, not working well enough.
- ▶ To summarize – too restrictive and clunky for operational use.
- ▶ New 2014 policy – Collapsed Lw 1 and Lw 3 zones together (entire area is SPZ Lw1, there no longer is Lw3), expanded boundaries of Lw1 and Lw2, and smoothed boundary lines

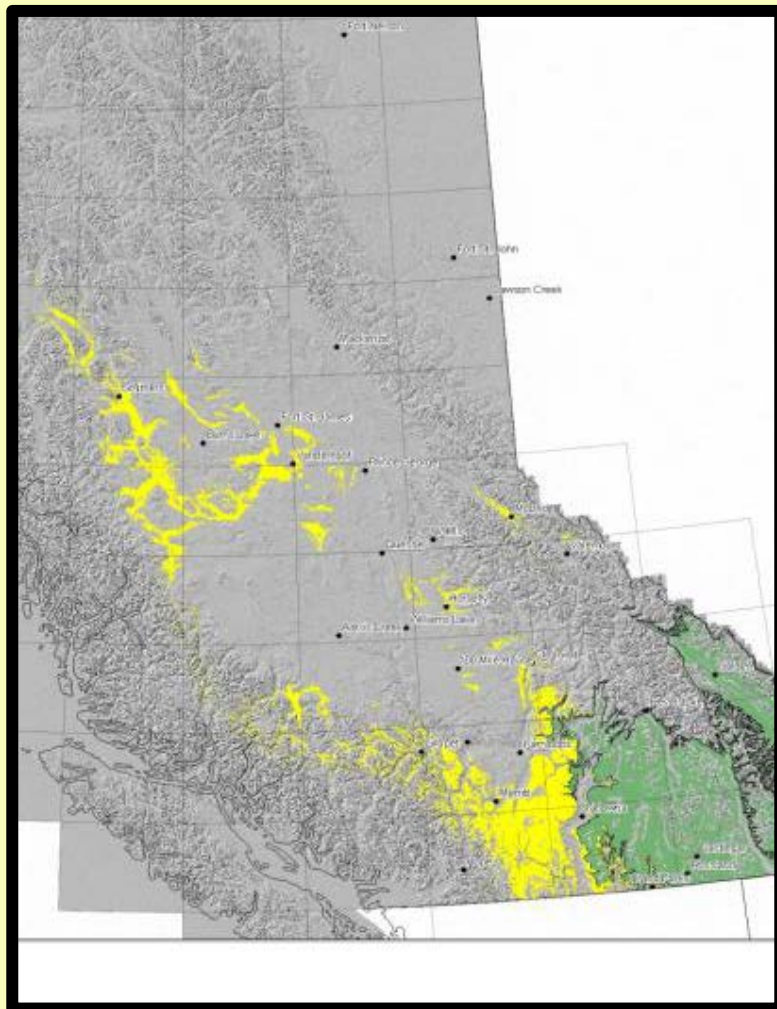


- General ecological guidance, by way of a CF memo (2010), provided information for planting Lw in the new zones and incorporating Lw into licensee stocking standards.
- Additional guidance on species and ecological suitability is provided in the stocking standards reference guide (Resource Practices Branch, 2014)

Year	Lw1	Lw2	Lw3	Total
	# in 000's			
2011	258	9		<u>267</u>
2012	392	56	22	<u>470</u>
2013	193	29	146	<u>368</u>
2014	576	45	173	<u>794</u>
2015	1,579	117	50	<u>1,746</u>
	2,998	256	391	3,645

iii) Western larch (2014 on right)

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Douglas-fir – long distance seed transfer

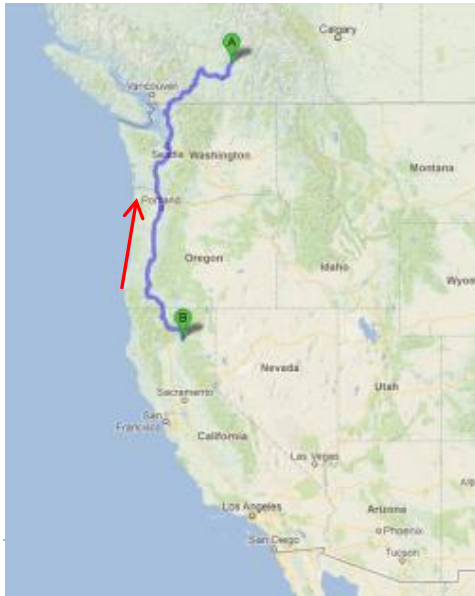
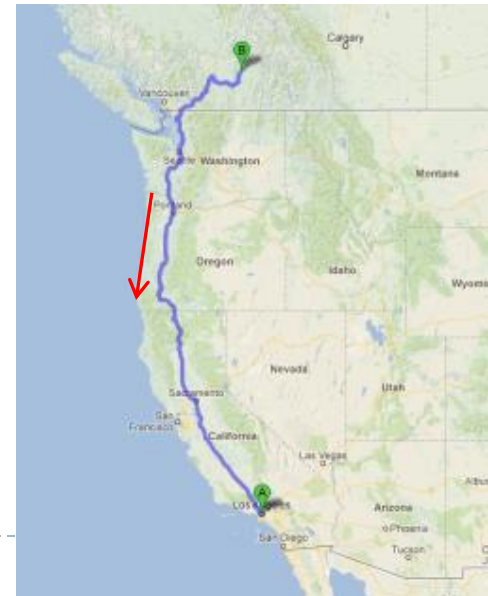




Image: Mike Carlson



Image: Sally Aitken



Image: Alex Woods



Image: R. Monchak



Image: L. Vanderveld

Increase seedlot
deployability

Reduce costs/complexity

Avoid maladaptation
due to climate change

SEED TRANSFER

Seedlot selection system



Weather - 11.3 Copyright (1988) Wang, Berkeley, Springfield and others. All rights reserved.

Select Time Scale
☒ 17 Annual ☐ Season ☐ Monthly

Coordinate Input
☒ Decimal ☐ Degree

Latitude: 10.2544
 Longitude: 719.2307
 Elevation (m): 888

Calculate Abort

Map

Output of annual variables

JAN	MAR	MAY	JUL	SEP	NOV	YR
17.2	18.7	21.1	23.4	22.7	18.1	40.2
10.0	10.0	10.0	10.0	10.0	10.0	10.0
10.0	10.0	10.0	10.0	10.0	10.0	10.0

Map

Map

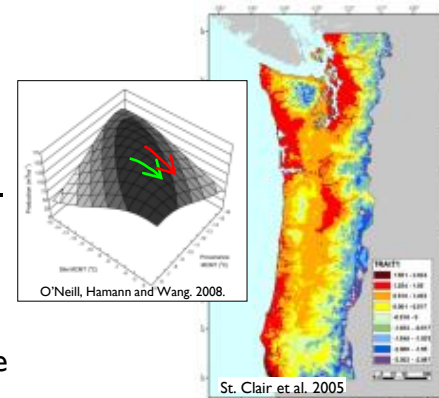
Data from: (Source: NOAA, NCEP, NCEP)

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New tools

New analysis techniques

New provenance data





- ▶ **Climate-based seed transfer project**
- ▶ Early information gathering prior to 2012
- ▶ Began in 2012
- ▶ Phase 1. Science Foundation
- ▶ Phase 2. Policy Development
- ▶ Phase 3. Implementation
- ▶ Phase 4. Monitoring and Revision



Phase	Title	Timeline (charter)	Timeline
Initiation			
I	Scientific foundation	March 2014	March 2015+
II	Policy development	2014-2016	2014-2017+
III	Policy implementation	2017+	2017-2020
IV	Monitoring and review		2017+

Phases are overlapping not hierarchical, Phase II is commencing although scientific work is not fully completed. Preliminary work (drafting of business case) for Phase III is also started.



CBST Project Management – Next Steps:

Activities/Deliverables	Target date
Complete Master Plan	February, 2015 ✓
Complete communication plan	February, 2015 ✓
Complete Phase 1 and 2 project plans	February, 2015 ✓
Identify a CBST project stakeholder advisory group	March, 2015
Identify a CBST project steering committee	March, 2015
Continuous outreach and communication	On-going



CBST Project Management, Phase I Science Foundation – Next Steps:

Activities/Deliverables	Target date	
Genetic Suitability Matrices Draft	January, 2015	✓
Technical Report (First DRAFT)	March, 2015	
Scientific and Peer Review	April, 2015 – June, 2015	
Technical Report (Second DRAFT)	April, 2015	
Technical Report FINAL and signoff	July, 2015	
Genetic Suitability Matrices FINAL	July, 2015	



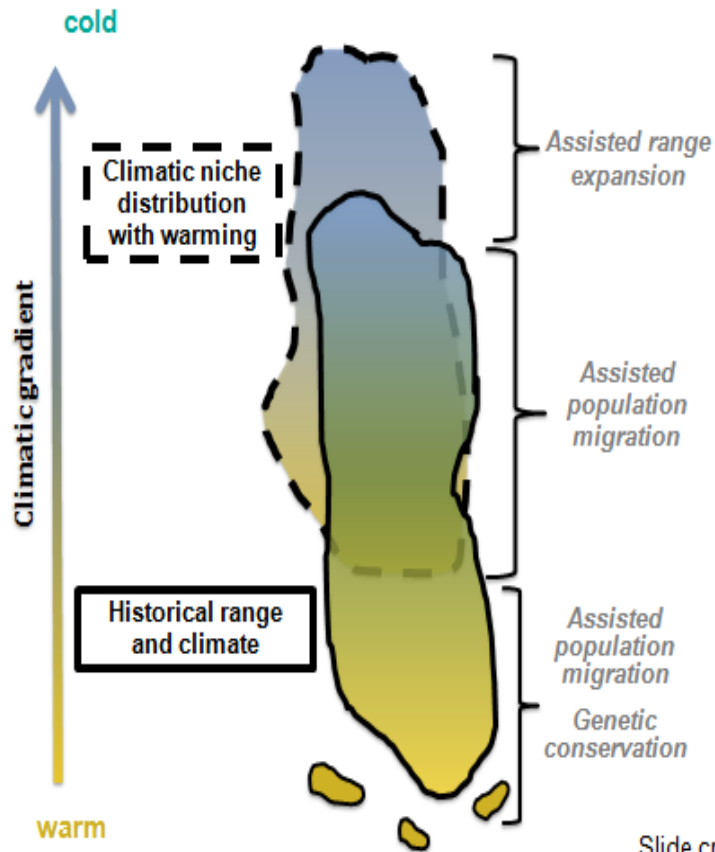
CBST Project Management, Phase 2, Policy Development - Next Steps:

Activities/Deliverables	Target date	
Identify a policy working group	April, 2015	
Information gathering	April, 2015	
Scoping and 'Design and Approach'	July, 2015	
Communication and outreach	On-going	



CBST Project Management, Phase 3, Implementation - Next Steps:

Activities/Deliverables	Target date	
Add CBST to Tree Improvement Branch's Information System plan	January 2015	✓
Follow-up on submission of IM/IT project brief	TBD	



Assisted migration

Slide credit to Dr. Sally Aitken UBC



WHAT OTHER WORK IS UNDERWAY TO INVESTIGATE RESPONDING TO CLIMATE CHANGE FROM A SEED PERSPECTIVE?

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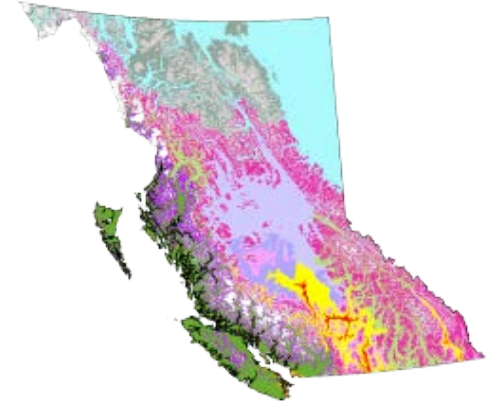
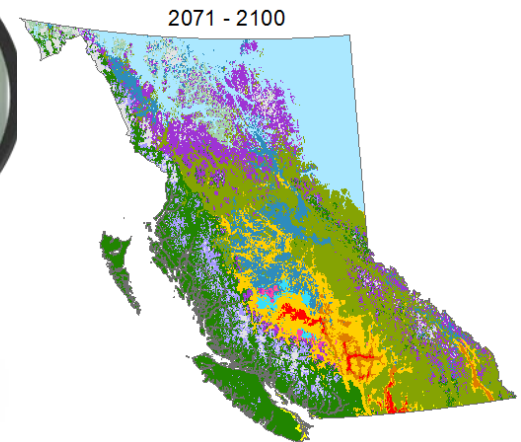


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AdapTree 

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OTHER SEED TRANSFER MATTERS FROM THE POLICY FRONT

- ▶ Consideration of seed selection based upon site productivity
- ▶ Silvicultural discussions of forest health issues trumping seedlot selection (i.e. choosing natural stands (B) class lodgepole pine seed in areas with rust hazard)
- ▶ Diversity: multi-lots or mixing lots for planting



Thank you

- ▶ **Contact information:**

- ▶ Lee.Charleson@gov.bc.ca

- ▶ <http://www2.gov.bc.ca/gov/topic.page?id=3B29FA5964254123BE2C482F43E12FA9>